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EXAMINER	
OSINSKI, MICHAEL S	

ART UNIT	PAPER NUMBER
2622	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/663,675	COLE ET AL.	
	Examiner	Art Unit	
	MICHAEL OSINSKI	2622	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 April 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *11-16,18-21,23,25,28,30,31 and 58-67* is/are pending in the application.

4a) Of the above claim(s) *23,25 and 28* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *11-16,18-21,30,31 and 58-67* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 November 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 4/16/2010 has been entered. Claims 11-16, 18-21, 23, 25, 28, 30, 31, and 58-67 are currently pending with claims 23, 25, and 28 withdrawn from further consideration.

Response to Arguments

2. The Applicant's arguments regarding the claims have been fully considered but are moot in view of new ground(s) of rejection using the previously cited and relied upon references in a manner different from the previous application of the references with respect to the pending claims.

Claim Rejections – 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. ***Claims 11-12, 14-15, 18, 20-21, 30-31, 58-64, and 66-67 are rejected under 35 U.S.C 103 as being unpatentable over Merrill (US Patent 7,132,724) [hereafter Merrill] in view of Descure (US Patent 6,960,799) [hereafter Descure] and Merrill (US PGPub 2002/0058353) [hereafter Merrill 2].***

5. As to claim 11, Merrill discloses an image pixel array (Fig. 17) comprising rows and columns of color-filter detectors (Fig. 7) that each comprise a substrate comprising of p-type layers (62, 64, 74, and 86) and a silicon overlayer (62a), a first photosensor (green photosensor 78) disposed at or beneath the surface of the substrate, a first filter (80) of a p-type layer over the first photosensor and in contact with the substrate (doping region 76 of substrate component 74 and isolation regions 88 of substrate component 86), the first filter having a first thickness from being a part of a 1 micron p-type layer (74) and absorbing incident light with wavelengths shorter than those of green light and transmitting light at wavelengths greater or equal to green light onto the photosensor that receives the light passed through the first filter (as shown in Figure 7 where light rays of wavelengths characteristic of green and blue light end at detector 78 and red light rays pass through detector 78), the first photosensor absorbing/holding the charges created by light having wavelengths equivalent to green light and passes on red light which has a longer wavelength, a second photosensor (red detector 68) at or beneath the surface of the substrate and laterally adjacent to the first photosensor (78), as illustrated in Figure 7 being placed offset laterally to the first photosensor (78), that has a second filter (70) comprising of a p-type layer disposed over the second

photosensor (68) and in contact with the substrate (doping region 66 of substrate component 64 and doping regions 76 of substrate component 74), the second filter being thicker than the first filter from being part of a thicker 2 micron p-type layer (64) (Fig. 7), that absorbs light with wavelengths less than those of red light and allows red light to pass through to the second photosensor (red 68) that receives the light passed through the second filter and absorbs/holds the charges created by light having wavelengths equivalent to red light and passes on light with wavelengths longer than those of red light (as shown in Figure 7 where light rays of wavelengths characteristic of red light end at detector 68), and a third photosensor (blue detector 90) at or beneath the surface of the substrate and laterally adjacent to the first and second photosensors (78 and 68), as shown in Figure 7 being placed offset to the first and second photosensors, that absorbs incident light (blue light) at wavelengths shorter than the first wavelength and passing a majority of incident light at wavelengths longer than the first wavelength (green light) (as shown in Figure 7 as the blue light ray stops at detector 90 and the red and green light rays pass through the detector 90) (Col. 5, 37-46, 62-67, Col. 6, 4-66, Col. 14, 45-67, Col. 16, 34-42).

It is however noted that Merrill fails to disclose that the filter disposed over the photosensing region is a polysilicon filter, an insulating material in contact with the surface of the substrate directly above the third (blue) photosensor, and a filter being connected to a ground terminal configured to drain charge from the first filter.

On the other hand, Descure discloses an imaging device (Fig. 2C) comprising of red, green, and blue photosensing regions (1R, 1G, and 1B) that are disposed within a

substrate (2) and a color filter placed over the photosensing regions (Fig. 1A, 1, Fig. 2C, 1R-1B) and substrate, formed at and extending within the substrate (2), that includes a polysilicon layer (5) that is disposed over columns of silicon oxide (4) that vary in thickness for each color sensing region, the variation in thickness allocating which light wavelengths are allowed to reach the photosensing regions wherein the blue photosensing region (1B) has an insulating layer of silicon oxide (4-3) disposed directly above the region and in contact with the surface of the substrate (as shown in Fig. 1A where the silicon oxide layer contacts the substrate 2) that acts as an insulating material (Col. 1, 20-29, Col. 2, 19-46, Col. 3, 1-20, Col. 4, 5-9).

Additionally, Merrill 2 discloses a vertical color filter detector (Figs. 2A and Fig. 3) that detects red, green, and blue light that is incident upon the filter comprising of p-type semiconductor regions (32, 36, and 40) act to isolate and provide filters for n-type photodiodes (34, 38, and 42) that absorb the light incident upon the photodiode layers of the vertical color detector in order to produce electric carriers representing the image signal formed by the incident light and also discloses that the p-type regions disposed above the n-type photodiodes are all connected to a fixed ground potential, the connection of the p-type layers to the ground potential being a terminal that enables the p-type layers to act as reference layers where charges within the p-type layers are drained away (or set to the connected ground potential) (Page 1, 0014, Page 2, 0028, 0030-0032, Page 3, 0033).

It would have been obvious to one having ordinary skill in the art at the time of invention to connect particular filter elements to a ground terminal for placing the filter at

a reference ground potential (draining charges from the filter layer) as taught by Merrill 2 and to use polysilicon layers disposed over the photosensors to act as color filters and include an insulating material in contact with the surface of a substrate directly above the blue photosensor as taught by Descure with the pixel array of Merrill because the prior art are directed towards color sensors with color filters disposed above the sensing regions and because all the claimed limitations are disclosed within the cited prior art and because connecting a filter to a ground terminal would enable prevention of charge buildup within the filter and interference between the photosensing elements of the array and using polysilicon layers of varying thicknesses as the color filters (70 and 80) is well known within the art and would enable the pixels within Merrill to absorb incident wavelengths of light that aren't long enough to pass through the color filter of a specific thickness as well as pass incident wavelengths of light long enough to penetrate through the color filter and reach the corresponding photosensor to capture the light wavelengths passed through the color filter and providing the insulating layer above the blue photosensing region at the top of the pixel would enable various other electrical connections to be made with the pixels.

6. As to claim 12, Merrill illustrates the first (78), second (68), and third (90) photosensors are formed beneath an upper surface (isolation regions 88 of substrate component 86) of the substrate (p-type layers 62, 64, 74, and 86).

7 As to claim 14, Merrill teaches that filter component (80) is formed to attenuate light of blue wavelengths while passing light of green and red wavelengths to sensing region (78) (Fig. 7, Col. 5, 37-46, Col. 6, 23-33).

8. As to claim 15, Merrill teaches that filter component (70) attenuates light with blue and green wavelengths, while passing light of red wavelengths to the sensing region (68) (Fig. 7, Col. 5, 37-46, Col. 6, 15-22).

9. As to claim 18, Descure teaches a silicon nitride layer (6) is formed over the polysilicon layer (5) providing insulation (Col. 2, 24-27).

10. As to claim 20, Merrill teaches the pixel array may be fabricated to an arbitrary size, which includes about 1.3 megapixels to about 4 megapixels (Col. 16, 34-39).

11. As to claim 21, Merrill teaches that the filter components surround the sensing regions vertically (70, 80, 96) and horizontally (66, 76, 88) create a sealed container around the sensing region, enabling the blocking of non-normally incident light. Merrill also teaches that a light shield (104) is included to only allow light through an aperture (106) to reach the sensing elements, thereby also blocking non-normally incident light (Col. 6, 51-55).

12. As to claim 30, Merrill teaches an imager integrated circuit (Fig. 15) to be used with an array of color-filter detectors (Fig. 17) and the corresponding circuitry (270-282). The color-filter detectors each comprise a substrate comprising of p-type layers (62, 64, 74, and 86) and a silicon overlayer (62a), a first photosensor (green photosensor 78) disposed at or beneath the surface of the substrate, a first filter (80) of a p-type layer over the first photosensor and in contact with the substrate (doping region 76 of substrate component 74 and isolation regions 88 of substrate component 86), the first filter having a first thickness from being a part of a 1 micron p-type layer (74) and absorbing incident light with wavelengths shorter than those of green light and transmitting light at wavelengths greater or equal to green light onto the photosensor that receives the light passed through the first filter (as shown in Figure 7 where light rays of wavelengths characteristic of green and blue light end at detector 78 and red light rays pass through detector 78), the first photosensor absorbing/holding the charges created by light having wavelengths equivalent to green light and passes on red light which has a longer wavelength, a second photosensor (red detector 68) at or beneath the surface of the substrate and laterally adjacent to the first photosensor (78), as illustrated in Figure 7 being placed offset laterally to the first photosensor (78), that has a second filter (70) comprising of a p-type layer disposed over the second photosensor (68) and in contact with the substrate (doping region 66 of substrate component 64 and doping regions 76 of substrate component 74), the second filter being thicker than the first filter from being part of a thicker 2 micron p-type layer (64) (Fig. 7), that absorbs light with wavelengths less than those of red light and allows red light to pass through to

the second photosensor (red 68) that receives the light passed through the second filter and absorbs/holds the charges created by light having wavelengths equivalent to red light and passes on light with wavelengths longer than those of red light (as shown in Figure 7 where light rays of wavelengths characteristic of red light end at detector 68), and a third photosensor (blue detector 90) at or beneath the surface of the substrate and laterally adjacent to the first and second photosensors (78 and 68), as shown in Figure 7 being placed offset to the first and second photosensors, that absorbs incident light (blue light) at wavelengths shorter than the first wavelength and passing a majority of incident light at wavelengths longer than the first wavelength (green light) (as shown in Figure 7 as the blue light ray stops at detector 90 and the red and green light rays pass through the detector 90) (Col. 5, 37-46, 62-67, Col. 6, 4-66, Col. 14, 45-67, Col. 16, 34-42), and a pinned-diode barrier gate (Fig. 14) used for reading-out charges generated by the color-filter detector which is formed on the surface of the substrate (250).

The color filters (76, 80) surrounding the first photosensing region (78) absorb light shorter than the wavelength of green (less than 490nm) and transmit wavelengths of green or higher (greater than 490) to the first photosensing region. The first photosensing region absorbs a majority of green light (490-575nm) and transmits light with wavelengths longer than that of green (greater than 575nm). The second containers/filters (66, 70) surrounding the second photosensing region (68) absorb light at wavelengths shorter than green light (490-575nm) and transmit light with wavelengths longer than that of green (greater than 575nm) to the second photosensing

region (68). The second photosensing region receives light passing through the container sections and absorbs red light (575-700nm), which has longer wavelengths than green light. Light with a wavelength greater than 700nm would be able to travel deeper within the detector as the longer wavelength implies the deeper the light will penetrate the body of the detector before it is absorbed, therefore light greater than 700nm would be transmitted through the second photosensing region (68) (Col. 5, 19-25, 37-46, 62-67, Col. 6, 4-55).

It is however noted that Merrill fails to particularly disclose first, second, and third sets of pixels that are at a same depth below a substrate's surface, that the filter disposed over the photosensing region is a polysilicon filter over each photodiode in the first set of pixels, a polysilicon filter over each photodiode in the second set of pixels, a filter being connected to a ground terminal configured to drain charge from the first filter, and an insulating material in contact with the surface of the substrate directly above the third photosensor.

On the other hand, Descure discloses an imaging device (Fig. 2C) comprising of red, green, and blue photosensing regions (1R, 1G, and 1B) that are disposed within a substrate (2) at the same depth below the surface of the substrate and a color filter placed over the photosensing regions (Fig. 1A, 1, Fig. 2C, 1R-1B) and substrate, formed at and extending within the substrate (2), that comprises a polysilicon layer (5) that is disposed over columns of silicon oxide (4) that vary in thickness for each color sensing region, the variation in thickness allocating which light wavelengths are allowed to reach the photosensing regions wherein the blue photosensing region (1B) has an

insulating layer of silicon oxide (4-3) disposed directly above the region and in contact with the surface of the substrate (as shown in Fig. 1A where the silicon oxide layer contacts the substrate 2) that acts as an insulating material (Col. 1, 20-29, Col. 2, 19-46, Col. 3, 1-20, Col. 4, 5-9).

Additionally, Merrill 2 discloses a vertical color filter detector (Figs. 2A and Fig. 3) that detects red, green, and blue light that is incident upon the filter comprising of p-type semiconductor regions (32, 36, and 40) act to isolate and provide filters for n-type photodiodes (34, 38, and 42) that absorb the light incident upon the photodiode layers of the vertical color detector in order to produce electric carriers representing the image signal formed by the incident light and also discloses that the p-type regions disposed above the n-type photodiodes are all connected to a fixed ground potential, the connection of the p-type layers to the ground potential being a terminal that enables the p-type layers to act as reference layers where charges within the p-type layers are drained away (or set to the connected ground potential) (Page 1, 0014, Page 2, 0028, 0030-0032, Page 3, 0033).

It would have been obvious to one having ordinary skill in the art at the time of invention to connect particular filter elements to a ground terminal for placing the filter at a reference ground potential (draining charges from the filter layer) as taught by Merrill 2 and to arrange photosensors beneath a surface of a substrate at similar depths and to use polysilicon layers disposed over the photosensors to act as color filters and include insulating material in contact with the surface of the substrate directly above the third (blue) photosensor as taught by Descure with the pixel array of Merrill because the prior

art are directed towards color sensors with color filters disposed above the sensing regions and because all the claimed limitations are disclosed within the cited prior art and because connecting a filter to a ground terminal would allow for prevention of charge buildup within the filter and interference between the photosensing elements of the array as well as provide an alternative configuration for the pixels/array with different sets of pixels within the array wherein each pixel has disposed above the photosensing region a filter with appropriate thickness allowing light of varying wavelengths (red, green, and blue) to reach the particular photosensing regions disposed at the same depth of the substrate using polysilicon layers as the color filters (70 and 80 and 96) that would yield predictable results of absorbing incident wavelengths of light that aren't long enough to pass through the color filter of a specific thickness as well as passing incident wavelengths of light long enough to penetrate through the color filter and reach the corresponding photosensor to capture the light wavelengths passed through the color filter and because providing an insulating layer above the blue photosensing region directly above the blue pixel would enable various other electrical connections to be made with the corresponding pixels.

13. As to claim 31, the Merrill, Descure, and Merrill 2 references disclose all claimed subject matter with regards the comments of claim 30.

Additionally, Descure also teaches that in the field of optical radiation, crystal silicon and polysilicon have similar refraction coefficients and the thickness of the layered materials can be adjusted to filter a specific wavelength of light; therefore the

polysilicon layer (5) can be replaced with a layer of crystal silicon, used as the substance of the substrate (2), and used as a color filter for the incident light impinging upon the photosensing regions (Col. 2, 23-33).

14. As to claims 58, 59, and 60, the Merrill, Descure, and Merrill 2 references disclose all claimed subject matter with regards the comments of claims 11, 30, and 31.

15. As to claim 61, the Merrill, Descure, and Merrill 2 references disclose all claimed subject matter with regards the comments of claim 11.

16. As to claim 62, the Merrill, Descure, and Merrill 2 references disclose all claimed subject matter with regards the comments of claim 12.

17. As to claim 63, the Merrill, Descure, and Merrill 2 references disclose all claimed subject matter with regards the comments of claim 14.

18. As to claim 64, the Merrill, Descure, and Merrill 2 references disclose all claimed subject matter with regards the comments of claim 15.

19. As to claim 66, the Merrill, Descure, and Merrill 2 references disclose all claimed subject matter with regards the comments of claim 18.

20. As to claim 67, the Merrill, Descure, and Merrill 2 references disclose all claimed subject matter with regards the comments of claim 21.

21. ***Claims 13 and 19 are rejected under 35 U.S.C 103 as being unpatentable over Merrill (US Patent 7,132,724) [hereafter Merrill] in view of Descure (US Patent 6,960,799) [hereafter Descure] and Merrill (US PGPub 2002/0058353) [hereafter Merrill 2], as applied to claims 12 and 18 respectively, in view of Rhodes (US Patent 6,815,743) [hereafter Rhodes].***

22. As to claim 13, both Merrill and Descure teach the first, second, and third photosensors of the pixel array are photodiodes (Merrill, Col. 6, 39, Descure, Col. 2, 19-34).

It is however noted that Merrill, Descure, and Merrill 2 fail to teach selecting the photosensor from a group consisting of a photodiode, photogate, photoconductor, or other image to charge converting device for initial accumulation of photo-generated charge.

On the other hand, Rhodes teaches a CMOS color detector (Fig. 12) in which the photosensitive elements (24a-24c) for each pixel cell (100a-100c) is a photogate, but can also be a photodiode, a photoconductor, or other photosensitive elements to accumulate photogenerated charge (Col. 9, 54-61).

It would have been obvious to one having ordinary skill in the art at the time of invention to choose a photosensor from amongst a group consisting of a photodiode,

photogate, photoconductor, or other image to charge converting device as taught by Rhodes with the pixel array of Merrill, modified with the teachings of Merrill 2 and Descure, because the prior art are directed towards imagers that capture incident light and convert captured light to electrical signals and because any of the listed photosensor types would allow the array of Merrill and Descure to function as described by enabling capture and conversion of incident light representing an image into photo-generated charges.

23. As to claim 19, Rhodes teaches an insulating cap layer (110a-110c) of silicon nitride where electrical contacts are formed (Col. 9, 54-67, Col. 10, 1-6).

24. ***Claim 16 and 65 are rejected under 35 U.S.C 103 as being unpatentable over Merrill (US Patent 7,132,724) [hereafter Merrill] in view of Descure (US Patent 6,960,799) [hereafter Descure] and Merrill (US PGPub 2002/0058353) [hereafter Merrill 2], as applied to claims 11 and 61, in view of Randazzo (US Patent 6,093,585) [hereafter Randazzo].***

25. As to claims 16 and 65, it is noted that Merrill, Descure, and Merrill 2 fail to teach a layer of tetraethyl orthosilicate is formed over the polysilicon layer.

On the other hand, Randazzo teaches a layer of dielectric material such as tetraethyl orthosilicate (TEOS) (Fig. 2C, 202) is formed over a layer of polysilicon (200) (Col. 1, 43-59).

It would have been obvious to one having ordinary skill in the art at the time of invention to including forming a layer of tetraethyl orthosilicate (TEOS) over a polysilicon layer as taught by Randazzo with the polysilicon filter within the pixel array of Merrill, modified with the teachings of Merrill 2 and Descure, because the prior art are directed towards solid-state semiconductor fabrications of electrical circuits and because the TEOS layer would provide a dielectric coating that can be used as a cap layer upon the layers of polysilicon within the pixels within the imaging device.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Osinski whose telephone number is (571) 270-3949. The examiner can normally be reached on Monday to Thursday 9 a.m. to 6 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on (571) 272-3022. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MO

/Jason Chan/
Supervisory Patent Examiner, Art Unit 2622